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(54) **CUSTOMIZABLE CENTER-OF-GRAVITY
GOLF CLUB HEAD**

Publication Classification

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ABSTRACT

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Related U.S. Application Data

(63) Continuation of application No. 10/043,421, filed on
Jan. 10, 2002, now Pat. No. 7,004,852.

A golf club head that allows a user to customize the location of the center of gravity. The golf club head comprises a club head having a hollow cavity with a weighting port. The weighting port allows a user to place weighting material inside the hollow cavity, customizing the location of the center of gravity, the swing weight, the total weight, and the balance of the golf club.

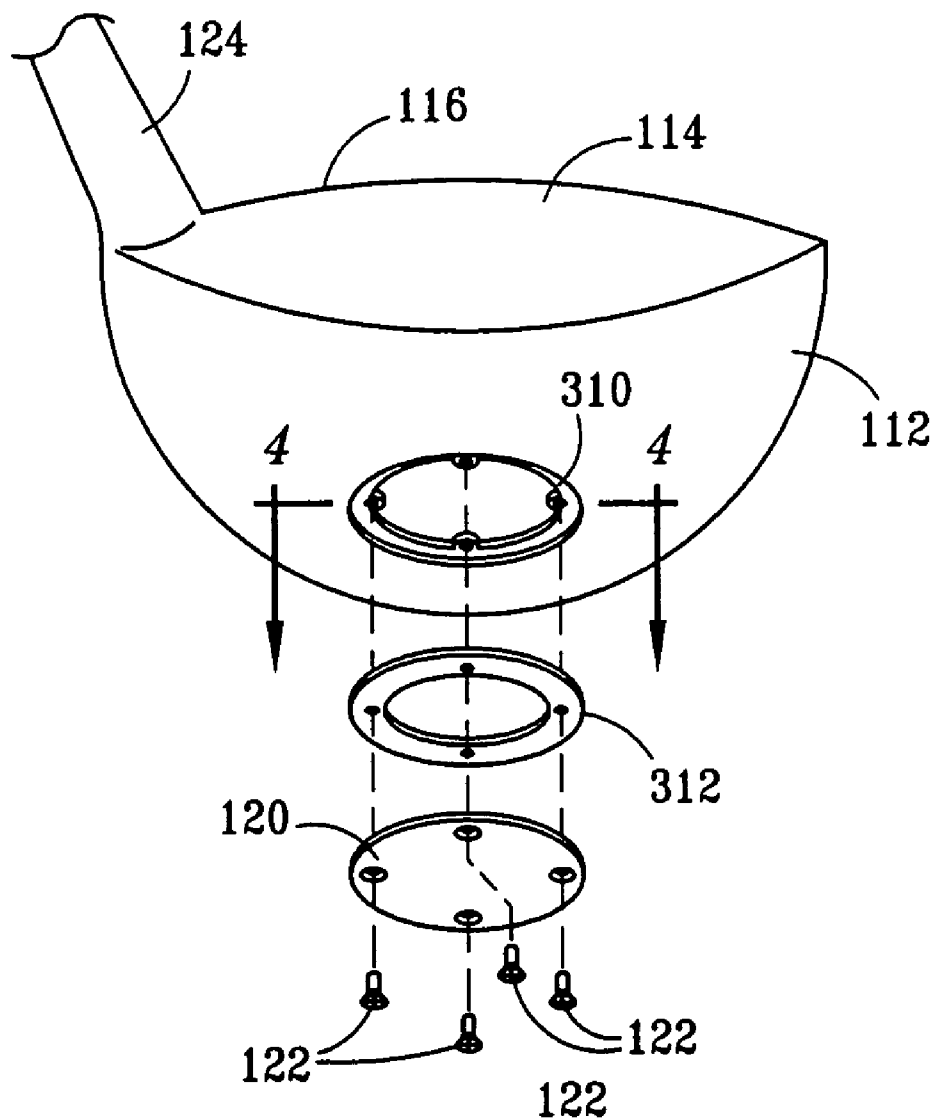


FIG. 1

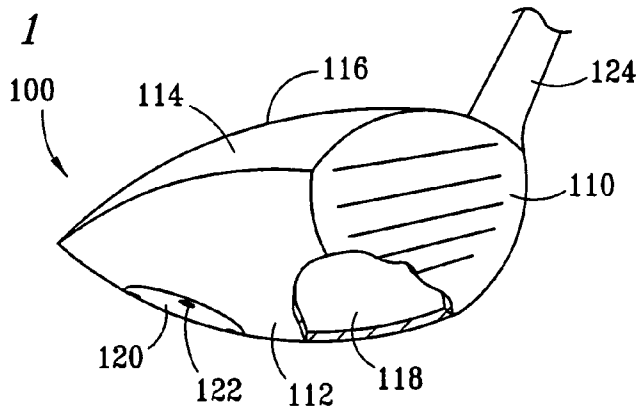


FIG. 2

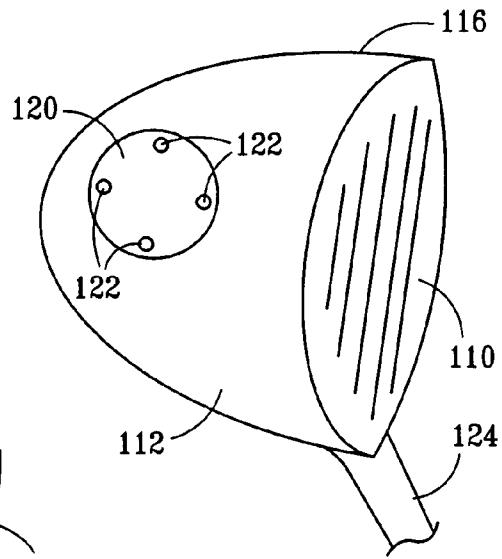


FIG. 3

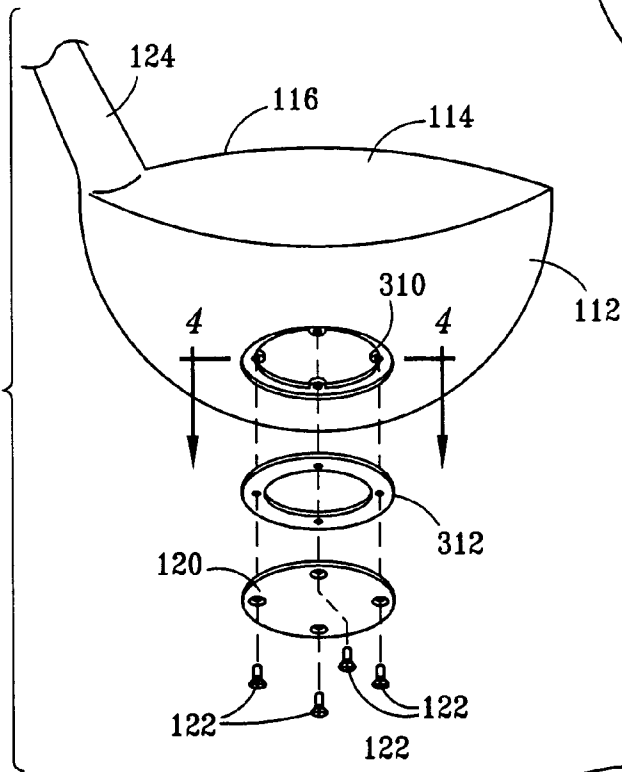


FIG. 4

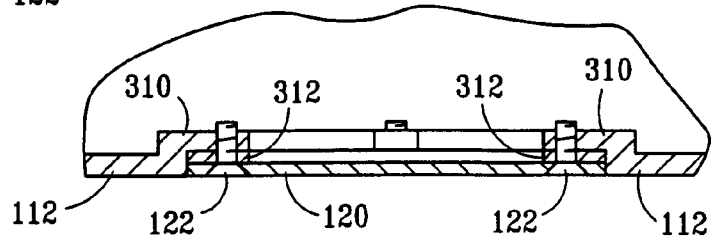


FIG. 5

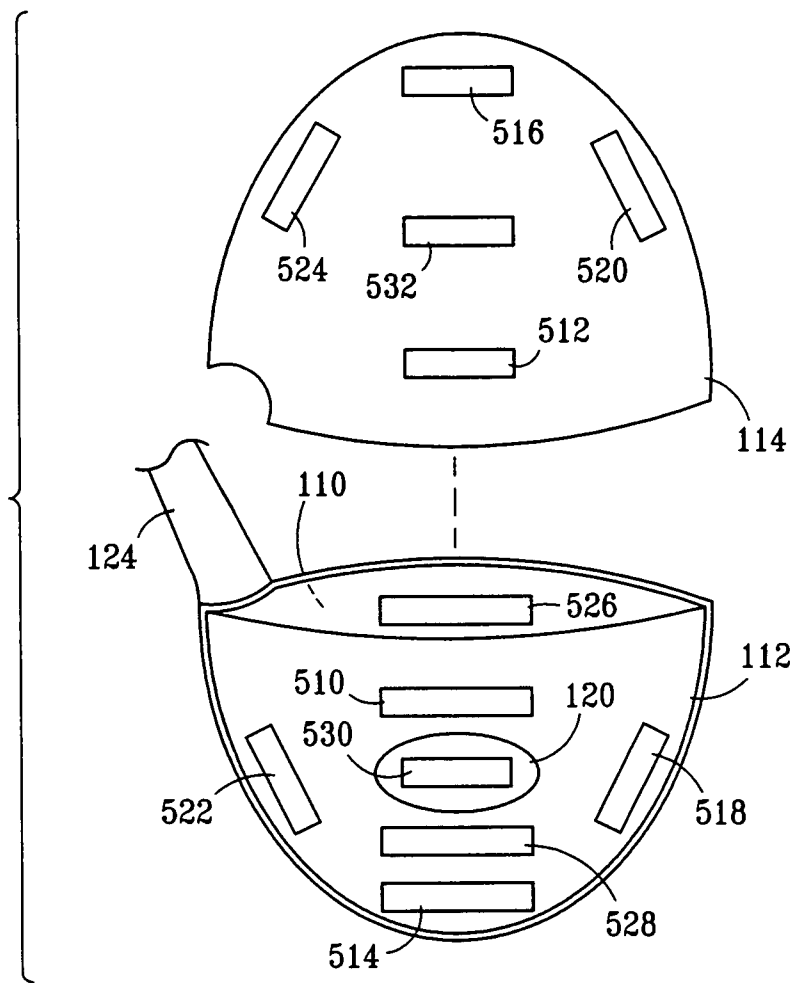


FIG. 6

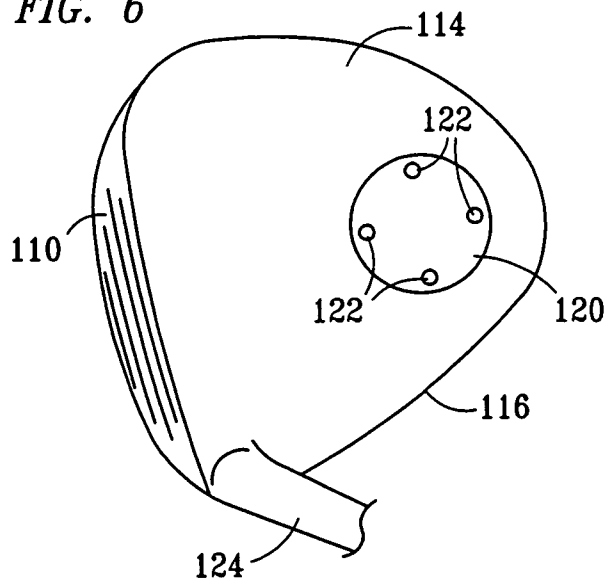


FIG. 7

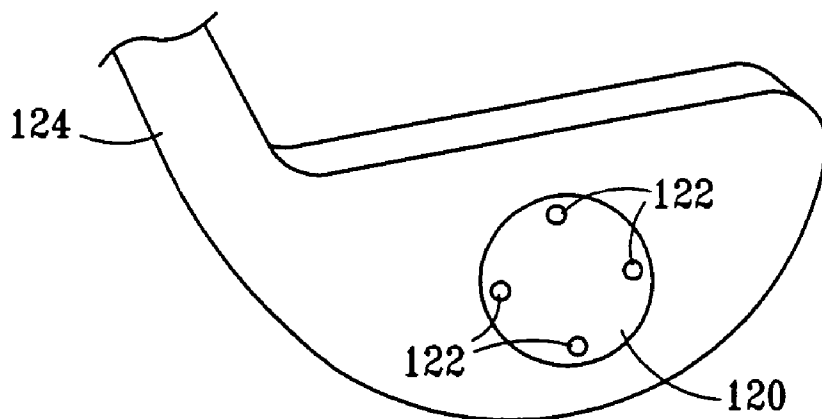
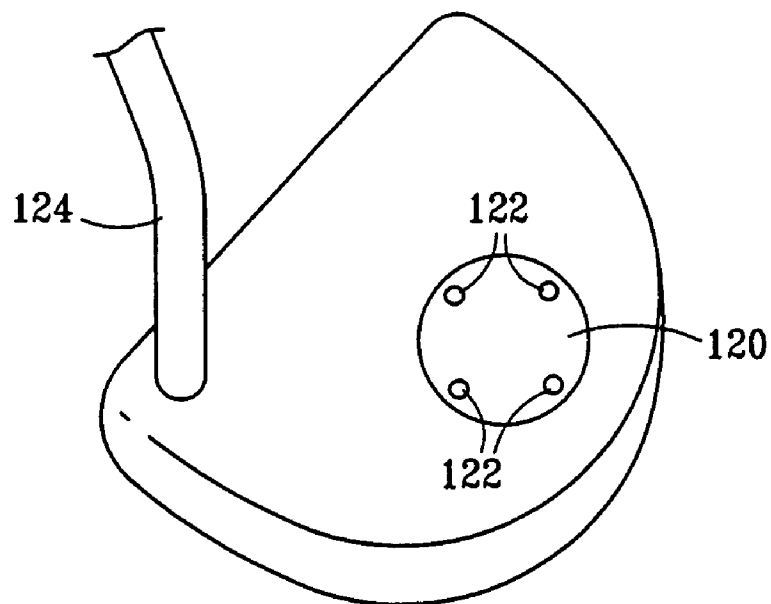


FIG. 8



CUSTOMIZABLE CENTER-OF-GRAVITY GOLF CLUB HEAD

FIELD OF THE INVENTION

[0001] The invention relates generally to golf clubs and, more particularly, to a golf club head in which the center of gravity, balance, and weight are customizable and can be altered to suit changing course conditions, weather conditions, and other user requirements.

BACKGROUND OF THE INVENTION

[0002] Golfers have long recognized that they could alter the weight, balance, and performance characteristics by selectively adding weight to club heads. Typically, weight is added by applying thin strips of lead tape with an adhesive backing to the club head. In this manner the swing weight is increased and the center of gravity (CG) is altered to change the dynamics of the head during the swing and, therefore, the ball flight characteristics after contact. The location of the lead tape, however, is generally limited to the back, crown, and sole of the club heads, where it would best stay affixed and not alter the look of the club. However, this limits the adjustability options available to the golfer. For example, the lead tape can not be put on the face of the club to move the CG closer to the front of the club. Forward movement of the center of gravity is more desirable to some golfers who want the club to be easier to "work", that is, to shape shots both in a left-to-right manner and in a right-to-left manner.

[0003] Furthermore, use of lead tape is generally an additive process, increasing the swing weight and total weight of the club was increased and oftentimes negatively affecting other performance characteristics of the club. Some golfers attempt to overcome this obstacle by grinding down or using other means to reduce the weight of the club. However, this often damages the protective finish of the club or the shape and configuration intended by the club designer, negatively affects the after market value of the club, and is both difficult and time-consuming for the golfer to adjust.

[0004] Furthermore, manufacturers of golf clubs have encountered problems manufacturing individual clubs to identical specifications, because of variances of the individual components themselves and when assembled together. Generally, manufacturers build clubs to a weight at, or slightly below, a targeted weight specification and then add additional weight to either or both of the head and the shaft, as desired, to increase either or both of the total weight and the swing weight to the desired specification. Additional weight is commonly added by pouring lead powder into the bottom of the shaft and sealing the shaft with a cork or other means. Alternatively, lead powder is mixed with putty, epoxy, or other materials that are inserted into the end of the shaft of the assembled head and shaft to facilitate this final weight adjustment by the manufacturer. These methods, however, may alter the CG of the club away from the optimal location, adversely effecting performance and feel.

[0005] Additionally, a common practice is to inject a hot melt glue or similar material into a hole in the club head during final assembly to arrive at a prescribed swing weight. The location that the glue puddles and adheres to the inner walls is determined by the orientation of the head while the glue is still hot and fluid. This technique is also used to customize the center of gravity of the club head for specific

golfers' needs. The location of the glue, however, is generally limited to one broad area due to the closed process, and once the glue is set, the glue is not adjustable.

[0006] Therefore, there is a need for a golf club head with a customizable CG that allows the CG to be altered by either or both the golfer and the manufacturer, both prior to and following final manufacture.

SUMMARY

[0007] The present invention provides a golf club that allows a user to customize the location of the center of gravity. The golf club comprises club head having a hollow cavity with a weighting port that allows the user to access the cavity. The weighting port allows a user to place weighting material inside the golf club head, thereby adjusting or customizing the location of the center of gravity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings, in which:

[0009] **FIG. 1** illustrates a metal golf club head that embodies features of the present invention;

[0010] **FIG. 2** illustrates a bottom view of a metal golf club head that embodies features of the present invention;

[0011] **FIG. 3** illustrates a rear view of a metal golf club head with a weighting port cover removed that embodies features of the present invention;

[0012] **FIG. 4** illustrates a cross-section view with the weighting port cover attached that embodies features of the present invention;

[0013] **FIG. 5** illustrates a metal golf club head with the crown portion removed to indicate some positions of weighting material;

[0014] **FIG. 6** illustrates a metal driver head embodying features of the present invention;

[0015] **FIG. 7** illustrates a metal iron golf club head embodying features of the present invention; and

[0016] **FIG. 8** illustrates a metal putter head embodying features of the present invention.

DETAILED DESCRIPTION

[0017] Referring to **FIG. 1** of the drawings, the reference numeral **100** generally designates a hollow golf club head embodying features of the present invention. The hollow golf club head **100** generally comprises a face portion **110**, a sole and wall portion **112**, and a crown portion **114** defining a housing or body **116** with an interior cavity **118**. A hosel portion **124** is connected to and/or integrated into the body **116** for receiving a shaft (not shown). A removable port cover **120** provides access to the interior cavity **118**, allowing placement of weighting material, such as lead tape, into the interior cavity **118**.

[0018] In the preferred embodiment, the hollow golf club head **100** comprises a two-piece golf club head. The first piece comprises the sole and wall portion **112** and the face portion **110**, including the hosel portion **124**. The second

piece comprises the crown portion **114**, which is welded or otherwise attached to the first piece. The present invention is not limited, however, to use with any particular construction of a golf club head, and may be utilized in single-piece and three-piece heads, as well as club heads constructed from any number of pieces.

[0019] **FIG. 2** is a bottom view of the hollow golf club head **100**, further illustrating the positioning and sizing of the weighting-port cover **120** in the preferred embodiment. Preferably, the weighting-port cover **120** is positioned on the bottom or sole of the hollow golf club head **100** and away from the face portion **110**. The weighting-port cover **120** is preferably positioned such that the weighting-port cover **120** is not visible by a golfer when addressing a golf ball. Furthermore, the placement of the weighting-port cover **120** away from the face portion **110** allows placement of weighting material about, or on, the interior side of the face portion **110**, and along the heel and toe portions of the hollow golf club head **100**.

[0020] The weighting port cover **120** is preferably attached to the body **116** via a plurality of flush-mounted bolts **122**, and, optionally, may be coated with a friction-reducing material, such as Teflon. In order to reduce the friction, the possibility of the weighting-port cover “snagging” on grass, thereby affecting the swing path, and the associated wear and tear, the weighting-port cover **120** is flush-mounted to the sole and wall portion **112** by the plurality of flush-mounted bolts **122**.

[0021] **FIG. 3** illustrates the hollow golf club head **100** with the weighting-port cover **120** removed. The body **116** preferably includes a recessed portion **310** configured for receiving an optional vibration-dampening ring **312** and the weighting-port cover **120**. The vibration-dampening ring **312**, such as a ring made from foam, rubber, and/or the like, allows the weighting-port cover **120** to be securely fastened, preventing a vibration or rattling noise that may occur as a result of swinging the club, moving the club, or striking a ball. The vibration-dampening ring **312** also seals the interior cavity **118** from exposure to outside elements, such as sand, water, or the like.

[0022] The plurality of flush-mounted bolts **122** pass through the weighting-port cover **120** and screw into the recessed portion **310** of the body **116**. Alternatively, other means and methods of attaching the weighting-port cover **120** may be used, such as a weighting-port cover that screws into the body **116**, latches, press-fits, or the like. The preferred embodiment utilizes a weighting-port cover **120** that is curved to match the contour of the body.

[0023] **FIG. 4** illustrates a side view of the weighting-port cover **120** attached to the body **116** in accordance with the embodiment of the present invention depicted in **FIG. 3**. As one skilled in the art will appreciate, the recessed portion **310** allows a flush mounting and a smooth contour to be formed when the sole and wall portion **112** and the weighting-port cover **120** are assembled. Alternatively, the weighting-port cover **120** could be recessed from the sole and wall portion, if desired.

[0024] **FIG. 5** illustrates the hollow golf club head **100** with the crown portion **114** separated from the sole and wall portion **112** and rotated to face the inner wall towards the reader in order to illustrate potential placements of weight-

ing material in accordance with embodiments of the present invention. The illustrated positions are presented for illustrative purposes only and, therefore, should not limit the present invention in any manner. Furthermore, the positions shown may be used individually or in combination to further customize the location of the center of gravity.

[0025] Weight location **510** illustrates a low-front-center location, which is located on the integrated sole and wall portion **112** adjacent to the face portion **110**, that tends to impart less spin on the ball and a higher trajectory, resulting in easier workability (the ability to hit the ball from left to right and vice versa) and more carry (the distance the ball travels in the air).

[0026] Weight location **512** illustrates a high-front-center location, which is located on the crown portion **114** adjacent to the face portion, that tends to impart less spin on the ball and a lower trajectory, resulting in easier workability, less carry, and more rolling.

[0027] Weight location **514** illustrates a low-back-center location, which is located on the back-center of the sole and wall portion **112**, that tends to result in more forgiveness and a higher trajectory.

[0028] Weight location **516** illustrates a high-back-center location, which is located on the back-center of the crown portion **114**, that tends to result in more forgiveness and a lower trajectory.

[0029] Weight location **518** illustrates a low-back-toe location, which is located on the back-center of the integrated sole and wall portion **112** along the toe, that tends to result in more forgiveness and a higher, fading trajectory.

[0030] Weight location **520** illustrates a high-back-toe location, which is located on the back-center of the crown portion **114** along the toe, that tends to result in more forgiveness and a lower, fading trajectory.

[0031] Weight location **522** illustrates a low-back-heel location, which is located on the back-center of the integrated sole and wall portion **112** along the heel, that tends to result in more forgiveness and a higher, drawing trajectory.

[0032] Weight location **524** illustrates a high-back-heel location, which is located on the back-center of the crown portion **114** along the heel, that tends to result in more forgiveness and a lower, drawing trajectory.

[0033] Weight location **526** illustrates a forward-center-center location, which is located on the center of the face portion **110**, that tends to result in easier workability with a neutral trajectory.

[0034] Weight location **528** illustrates a back-center-center location, which is located in the vertical-center of the integrated sole and wall portion **112**, that tends to result in neutrally forgiving club head.

[0035] Weight location **530** illustrates a low-center-center location, which is located on the center of the integrated sole and wall portion **112**, that tends to result in a neutral side-spin with a higher trajectory. Note that this location is located on the weighting-port cover **120** for illustrative purposes only. As stated above, the weighting-port cover **120** may be located at any desired location, and a weight may be placed on the weighting-port cover **120** if so desired.

[0036] Weight location 532 illustrates a high-center-center location, which is located in the center of the crown portion 114, that tends to result in a neutral side-spin with a lower trajectory.

[0037] FIG. 6 illustrates a driver golf club head embodying features of the present invention in which the weighting-port cover 120 is located on the crown portion 114.

[0038] FIG. 7 illustrates a hollow, iron golf club head embodying features of the present invention in which a weighting-port cover 710 is provided.

[0039] FIG. 8 illustrates a hollow, putter golf club head embodying features of the present invention in which a weighting-port cover 810 is provided.

[0040] It should be noted that the placement and size of the weighting port is shown for illustrative purposes only, and, therefore, should not limit the present invention in any manner.

[0041] It is understood that the present invention can take many forms and embodiments. Accordingly, several variations may be made in the foregoing without departing from the spirit or the scope of the invention. For example, the weighting port may be of a different shape and/or there may be a different method of accessing the interior of the club head, such as removing the sole of the club head, the back of the club head, or the like.

[0042] Having thus described the present invention by reference to certain of its preferred embodiments, it is noted that the embodiments disclosed are illustrative rather than limiting in nature and that a wide range of variations, modifications, changes, and substitutions are contemplated in the foregoing disclosure and, in some instances, some features of the present invention may be employed without a corresponding use of the other features. Many such variations and modifications may be considered obvious and desirable by those skilled in the art based upon a review of the foregoing description of preferred embodiments. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the invention.

1-24. (canceled)

25. A golf club head comprising:

a hollow club head body comprising a hollow shell having a plurality of walls that collectively form a front club head portion having a wall for striking a golf ball, a back club head portion and an original center of gravity prior to addition of any weights;

a plurality of weights readily user-repositionably securable to said club head body at readily user-accessible spaced-apart locations along the walls of the shell to adjust the center of gravity of the golf club head body;

wherein at least a portion of one of said weights is user-repositionably disposable behind and to the heel side of said original center of gravity;

wherein at least a portion of one of said weights is user-repositionably disposable behind and to the toe side of said original center of gravity; and

wherein at least a portion of one of said weights is user-repositionably disposable in front of said original center of gravity.

26. The golf club head defined in claim 25, wherein at least a portion of one of said weights is attached to a member detachably and user-accessibly attached to said body.

27. The golf club head defined in claim 26, wherein said member is screwably attached to said body.

28. The golf club head defined in claim 26, wherein there is at least one recess in said shell and wherein said member is attached by at least partially inserting the member into said recess in the shell such that the weight attached to the member is disposed at least partially inside a plane defined by adjacent portions of the shell.

29. The golf club head defined in claim 25 further comprising:

a recess in said body; and

wherein at least one of said weights is attached to a member disposed in said recess and detachably and user-accessibly screwably attached to said body.

30. The golf club head defined in claim 29, wherein substantially all of said weight attached to said screwably attached member is generally close to and inside a plane defined by the walls that are in the vicinity of said recess.

31. The golf club head defined in claim 26, wherein said member is readily accessible for screwable attachment and detachment from outside the shell.

32. A golf club head comprising:

a hollow club head body comprising a hollow shell having a plurality of walls that collectively form a front club head portion having a wall for striking a golf ball, a back club head portion and an original center of gravity prior to addition of any weights;

at least three weights readily user-repositionably secured to said shell of said club head at readily user-accessible spaced-apart locations along the walls of the shell to adjust the center of gravity of the golf club head body;

wherein at least a portion of one of said weights is user-repositionably disposable behind and to the heel side of said original center of gravity;

wherein at least a portion of one of said weights is user-repositionably disposable behind and to the toe side of said original center of gravity;

wherein at least a portion of one of said weights is user-repositionably disposable in front of said original center of gravity; and

wherein each of said weights is interchangeably repositionable by the user at each of said locations.

33. The golf club head defined in claim 32, wherein at least a portion of one of said weights is disposed above said original center of gravity and at least one-half of the number of said weights are disposed below said original center of gravity.

34. The golf club head defined in claim 32, wherein at least a portion of one of said weights is attached to a member detachably and user-accessibly attached to said body.

35. The golf club head defined in claim 32, wherein said member is screwably attached to said body.

36. The golf club head defined in claim 32, wherein there is at least one recess in said shell and wherein said member

is attached by at least partially inserting the member into said recess in the shell such that the weight attached to the member is disposed at least partially inside a plane defined by adjacent portions of the shell.

37. The golf club head defined in claim 32 further comprising:

a recess in said body; and

wherein at least one of said weights is attached to a screwably attached member disposed in said recess and detachably and user-accessibly screwably attached to said body.

38. The golf club head defined in claim 32, wherein substantially all of said weight attached to said screwably attached member is generally close to but inside a plane defined by the walls that are in the vicinity of said recess.

39. The golf club head defined in claim 32, wherein said member is readily accessible for screwable attachment and detachment from outside the shell.

40. The golf club head defined in claim 35, wherein substantially all of said weight attached to said screwably attached member is generally close to but inside a plane defined by the walls that are in the vicinity of said recess.

41. A golf club head comprising:

a hollow club head body comprising a hollow shell having a plurality of walls that collectively form a front club head portion having a wall for striking a golf ball, a back club head portion and an original center of gravity prior to addition of any weights;

at least four weights readily user-repositionably secured to said shell of said club head at readily user-accessible spaced-apart locations along the walls of the shell to adjust the center of gravity of the golf club head body;

wherein at least one of said weights is securable in a location that is substantially non-co-linear with the others of said weights to permit adjustment of the center of gravity of the golf club head in at least two axes;

wherein at least a portion of one of said weights is user-repositionably disposable behind and to the heel side of said original center of gravity;

wherein at least a portion of one of said weights is user-repositionably disposable behind and to the toe side of said original center of gravity;

wherein at least a portion of each of two of said weights is user-repositionably disposable in front of said original center of gravity; and

wherein each of said weights is interchangeably repositionable by the user at each of said locations.

42. The golf club head defined in claim 41 further comprising:

a recess in said body, and

wherein at least one of said weights is attached to a member disposed in said recess and detachably and user-accessibly screwably attached to said body.

43. The golf club head defined in claim 41, wherein at least a portion of one of said weights is attached to a member detachably and user-accessibly attached to said body.

44. The golf club head defined in claim 43, wherein said member is screwably attached to said body.

45. The golf club head defined in claim 41, wherein there is at least one recess in said shell and wherein said member is attached by at least partially inserting the member into said recess in the shell such that the weight attached to the member is disposed at least partially inside a plane defined by adjacent portions of the shell.

46. The golf club head defined in claim 41 further comprising:

a recess in said body; and

wherein at least one of said weights is attached to a member disposed in said recess and detachably and user-accessibly screwably attached to said body.

47. The golf club head defined in claim 44, wherein substantially all of said weight attached to said screwably attached member is generally close to but inside a plane defined by the walls that are in the vicinity of said recess.

48. The golf club head defined in claim 43, wherein said member is readily accessible for screwable attachment and detachment from outside the shell.

49. The golf club head defined in claim 26, wherein said member is screwed into said body.

50. The golf club head defined in claim 26, wherein said member is disposed on or near the sole of the club head.

51. The golf club head defined in claim 26, wherein said member is disposed on or near the crown of the club head.

52. The golf club head defined in claim 26, wherein said member is disposed on or near the back portion of the club head.

53. The golf club head defined in claim 26, wherein said member is disposed on or near the front portion of the club head.

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